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Job No.: CTCE/BBMP/W.No.09/BBU/WMM/Gradation/2015-16

11.05.2015

GRADATION FOR WMM
MORTH TABLE-400-11

Customer : **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.

Agency : **Mr. B.B. Umesh,**
#385, Bettaulsur (P), Bangalore North Taluk.

Name of Work : Deveopment of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Imrovements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.

Reference : EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015

Date of Testing : 11.05.2015

Material : WMM

Sample Location : WMM Mix Plant

Oven Dry Wt (gm): **5000**

Is Sieve Size in mm	Weight Retained (gm)	Cumulative Weight Retained (gm)	Cumulative % of Retained	Cumulative % of Passing	Spec.Limits
53	0	0	0	100	100
45	180	180	3.6	96.4	95-100
22.4	1605	1785	35.7	64.3	60-80
11.2	1050	2835	56.7	43.3	40-60
4.75	625	3460	69.2	30.8	25-40
2.36	490	3950	79.0	21.0	15-30
0.600	435	4385	87.7	12.3	8-22
0.075	490	4875	97.5	2.5	0-8

Note:

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Job No.: CTCE/BBMP/W.No.09/BBU/WMM/Gradation/2015-16

11.05.2015

GRADATION FOR WMM
MORTH TABLE-400-11

Customer : **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.

Agency : **Mr. B.B. Umesh,**
#385, Bettaulsur (P), Bangalore North Taluk.

Name of Work : Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Improvements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.

Reference : EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015

Date of Testing : 11.05.2015

Material : WMM

Sample Location : WMM Mix Plant

Oven Dry Wt (gm): **5000**

Is Sieve Size in mm	Weight Retained (gm)	Cumulative Weight Retained (gm)	Cumulative % of Retained	Cumulative % of Passing	Spec.Limits
53	0	0	0	100	100
45	135	135	2.7	97.3	95-100
22.4	1550	1685	33.7	66.3	60-80
11.2	1050	2735	54.7	45.3	40-60
4.75	725	3460	69.2	30.8	25-40
2.36	500	3960	79.2	20.8	15-30
0.600	285	4245	84.9	15.1	8-22
0.075	415	4660	93.2	6.8	0-8

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Job No.: CTCE/BBMP/W.No.09/BBU/WMM/AIV/2015-16 11.05.2015

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	Deveopment of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Imrovements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
Source / Location	WMM Plant
Type of Mix	Wet Mix macadam
Date of Testing	11.05.2015

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	382	384	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	80	81	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	302	303	
4	Aggregate Impact value = percent fines	20.94	21.09	
	100* (W_2/W_1)%			**21.02**

Comments:

→ Maximum allowable Aggregate Impact value for Wet mix Macadam is 30%

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Job No.: CTCE/BBMP/W.No.09/BBU/WMM/S-T/2015-16 11.05.2015

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of Work	Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Imrovements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
Technical Reference	IS 2386(Part 1) 1963 (RA 2011)
Type of Mix	Wet Mix Macadam
Date of Testing	11.05.2015

Civil-Tech Consultants & Engineers Bangalore

Result : Flakiness Index = **12.15%**

Elongation Index = **13.62%**

Result : Combined Flakiness & Elongation index 25.77%

Comments:

Maximum allowable Flakiness & Elongation Index for Wet Mix Macadam is 30%

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T-2377

Job No: CTCE/BBMP/W.No.09/BBU/CSR-05/944d/SDBC(QB)/2015-16 21.05.2015

TEST REPORT ON DETERMINATION OF BITUMEN CHARACTERISTICS

*CUSTOMER	:	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
*AGENCY	:	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
*NAME OF THE WORK	:	Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Improvements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
REFERENCE	:	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
*SAMPLE ID	:	Bitumen
DATE OF SAMPLING	:	19.05.2015
PERIOD OF TESTING	:	21.05.2015

The results of the tests conducted on the bitumen sample using for Semi Dense Bituminous Concrete.

Sl. No	Description	Test Method as per IS	Test Result	Requirement as per IS:73:2013
1	Penetration at 25 ^{0}C, 1/10 mm	IS :1203 -1978 (RA-2009)	86	80 to 100
2	Softening point, ^{0}C	IS :1205 -1978 (RA-2009)	46	Min. 40
3	Ductility at 27^{0}C, cm	IS :1208 -1978 (RA-2009)	100 >	Min. 75
4	Flash Point, ^{0}C	IS :1209 -1978 (RA-2009)	298	Min. 220

*Information is furnished by the Customer/Representative.

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VIDYARANI P.K.
Technical Manager

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/AIV/2015-16 21.05.2015

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Improvements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	21.05.2015

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	386	388	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	85	86	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	301	302	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	22.02	22.16	22.09

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/AGG/2016-17 22.05.2015

Aggregate Gradation Test

IS : 2386 Part I

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP,
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Improvements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
Sample I / D	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete (SDBC)
Date of Testing	22.05.2015

Total Weight of Sample: **5300** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade II MORTH specification
9.5	360	6.8	6.79	93.21	90-100	
4.75	2715	51.2	58.02	41.98	35-51	
2.36	605	11.4	69.43	30.57	24-39	
1.18	485	9.2	78.58	21.42	15-30	
0.3	360	6.8	85.38	14.62	9-19	
0.075	485	9.2	94.53	5.47	3-8	

Total Weight of Sample: **5400** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade II MORTH specification
9.5	305	5.6	5.65	94.35	90-100	
4.75	2515	46.6	52.22	47.78	35-51	
2.36	635	11.8	63.98	36.02	24-39	
1.18	455	8.4	72.41	27.59	15-30	
0.3	585	10.8	83.24	16.76	9-19	
0.075	585	10.8	94.07	5.93	3-8	

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Shape_T/2015-16 21.05.2015

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of Work	Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Improvements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
Technical Reference	IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	21.05.2015

Civil-Tech Consultants & Engineers Bangalore

Result : Flakiness Index = **12.38%**

Elongation Index = **13.92%**

Result : Combined Flakiness & Elongation index **26.30%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Stripping/2015-16 22.05.2015

Stripping Value of Road Aggregates (Static Immersion Test)

IS: 6241

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the work	Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Improvements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	22.05.2015

Type of binder : 80/100
Percentage of binder used : 5.0% by wt.
Total weight of aggregate : 200 g
Total weight of binder : 10.0 g
Temperature of water-bath : 40° C

Observation Number	Stripping, Percentage	Average, Percentage	Average Retained Coating, %
1	3.1	3.20	96.80
2	3.2		
3	3.3		

Comments:

→ Minimum allowable Aggregate retained coating for Semi Dense Bituminous Concrete is 95 %

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Sp_Wa/2015-16 22.05.2015

Specific Gravity And Water Absorption Test

IS: 2386 Part III

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Improvements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
Type of Mix	Semi Dense Bituminous Concrete
Source / Location	Hotmix Plant, Bangalore
Date of Testing	22.05.2015

Sl. No.	Details	Notation	Test Number			Mean Value
			Test 1	Test 2	Test 3	
1	Weight of aggregate suspended in water with the basket	W_1 g	2004	2005	2006	
2	Weight of basket suspended in water	W_2 g	750	750	750	
3	Weight of saturated aggregate in water	$(W_1 - W_2) = W_s$ g	1254	1255	1256	
4	Weight of saturated surface dry aggregate in air	W_3 g	2008	2009	2010	
5	Weight of water equal to the volume of the aggregate	$(W_3 - W_S)$ g	754	754	754	
6	Weight of oven dried aggregate	W_4 g	1996	1996	1994	
7	Specific Gravity	$W_4/(W_3-W_S)$	2.647	2.647	2.645	2.646
8	Apparent Specific gravity	$W_4/(W_4-W_S)$	2.690	2.694	2.702	2.695
9	Water Absorption	$((W_3-W_4)*100)/W_4$	0.60%	0.65%	0.80%	0.68%

Comments:

→ Maximum allowable Aggregate Water absorption value for Semi Dense Bituminous Concrete is 2%

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Bitumen/2015-16 22.05.2015

BITUMEN DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

AS per IRC : SP : 11 - 1984

CUSTOMER	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
AGENCY	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
NAME OF THE WORK	Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Improvements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
REFERENCE	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
SAMPLE I/D	Roads at Ward No.09, BBMP, Bangalore.
DATE OF TESTING	22.05.2015

BITUMEN CONTENT DETERMINATION

Description	Trail 1	Trail 2
1. Weight of Mixture before Test, g	500	500
2. Weight of Mixture after Test, g	475	474
3. Weight of Asphalt and Mineral matter Extracted, g	-	-
4. Weight of Mineral Matter, g.	-	-
5. Weight of Ash, g		
6. Weight of Bitumen Extracted, g. (corrected)	25	26.00
7. Bitumen content in %	5.00	5.20
8. Average	**5.10**	

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Bitumen/2015-16 22.05.2015

GRADATION DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

As per IS : 2386 and IRC : SP : 11 - 1984

CUSTOMER	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
AGENCY	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
NAME OF THE WORK	Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Improvements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
REFERENCE	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
SAMPLE I/D	Roads at Ward No.09, BBMP, Bangalore.
DATE OF TESTING	22.05.2015

GRADATION AFTER EXTRACTION

Sieve Size in mm	Trail 1				Specified Limits as per MORTH specification table 500-15 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	26.35	5.55	5.55	94.45	90-100
4.75	260.8	54.91	60.45	39.55	35-51
2.36	50.26	10.58	71.03	28.97	24-39
1.18	51.25	10.79	81.82	18.18	15-30
0.3	22.36	4.71	86.53	13.47	9-19
0.075	36.32	7.65	94.18	5.82	3-8

Sieve Size in mm	Trail 2				Specified Limits as per MORTH specification table 500-15 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	35.26	7.44	7.44	92.56	90-100
4.75	260.5	54.96	62.40	37.60	35-51
2.36	58.56	12.35	74.75	25.25	24-39
1.18	44.36	9.36	84.11	15.89	15-30
0.3	22.12	4.67	88.78	11.22	9-19
0.075	24.55	5.18	93.96	6.04	3-8

Note:

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- The results indicated above are based on the tests carried out on the samples received in the laboratory
- Any Query regarding the report must be reported within 30 days from the date of testing.

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Stability/2015-16 22.05.2015

TEST REPORT ON STABILITY OF MIX

Customer	:	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	:	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	:	Development of Suvarna Mahotsava Ground in roads in Ward No.09, Vidyaranyapura Sub Division (Change of Work: Improvements to Metalling & asphalting at Virupakshapura Maramma temple to Indian Express Layout Road in ward No.09, Vidyaranyapura Sub Division), BBMP, Bangalore.
Reference	:	EE/BTP/BBMP/E-PMT/10(16725)WO/71/2015-16 Dated: 06.05.2015
Source of location	:	Hot mix Plant, Bangalore
Type of Mix	:	Semi Dense Bituminous Concrete
Date of Testing	:	22.05.2015

The results of the tests conducted on the Semi Dense Bituminous Concrete mix sample are as follows:

Sl. No	Description	Test Result 1	Test Result 2	Requirement as per MORTH (Table 500-16)
1	Marshal Stability, Kn	8.60	8.85	8.2 Kn (min)
2	Marshal flow, mm	3.20	3.50	2 – 4
3	Percent air voids in Mineral Aggregate	3.35	4.10	3 – 5
4	Voids in Compacted Mix	13.60	14.05	13 – 15
5	Percent Voids filled with Bitumen	66.15	67.85	65 - 78
6	Density, g/cc	2.26	2.27	--

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Note:

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